George C. Marshall Space Flight Center
Marshall Space Flight Center, Alabama 35812

QD-QE-001
REVISION H
EFFECTIVE DATE: May 5, 2006

ORGANIZATIONAL INSTRUCTION

PROJECT QUALITY INSTRUCTION

OPR(s)	**OPR DESIGNEE**
QD10, QD20, QD30, and QD40	**Ken Crane**

DOCUMENT HISTORY LOG

Status (Baseline/ Revision/ Canceled)	Document Revision	Effective Date	Description
Baseline		11/18/97	
Revision	A	02/05/99	Revised to update document number, document format, applicable documents and to change discipline from QA to QE. No technical changes made to document.
Revision	B	6/9/99	Changes made to reflect new organization code changes and/or Changes made to reflect new directives renumbering scheme and to incorporate the corrective action for closure of NCR 266
Revision	C	11/30/99	Updated template and reference documents.
Revision	D	09/06/00	Complete rewrite to incorporate project quality requirements and guidelines into one document, which results in the cancellation of QS01-QE-002 and QS01-QE-006. Changed title to "Project Quality Instruction" to make it more descriptive.
Revision	E	9/09/02	Format and numbering change to implement requirements of QS-A-001 rev F.
Revision	F	10/15/04	Revised to bring document in compliance with the HQ Rules Review Action (CAITS: 04-DA01-0387). Changes were also made to reflect S&MA organizational name changes (i.e., QS to QD). Appendix B rewritten in its entirety to match the clauses published by the NASA HQ S&MA which reflect the requirements of AS9100
Revision	G	3/28/05	Administrative change corrected web link in 4.1 to https://masterlist.msfc.nasa.gov/mpdms/templates/Quality_Plan_Template.doc
Revision	H	4/14/06	Added text to 4.1 to address utilization of reliability and system safety documentation in planning, as well as what to do in case of material with expired shelf life, Spelled out first time use of acronyms, 4.1added content requirement for S&MA plans included in Program Plans, 4.1.2, corrected name of QE support team, 4.1.2 added "or appropriate project memo", Section 5 corrected deleted revision, Section 8 corrected responsible organizations

PROJECT QUALITY INSTRUCTION

1. PURPOSE, SCOPE, APPLICABILITY

1.1. Purpose. This instruction provides minimum requirements and guidelines to S&MA personnel that perform a project quality function for several areas of quality including developing quality plans, assigning procurement quality requirements, reviewing drawings, assigning inspection points, and delegating QA responsibilities to other agencies. This document also provides minimum requirements to be performed by the MSFC Inspection and Test Area Teams for several areas.

1.2 Scope. The document is for in-house activities and is not intended to address all the tasks performed by the quality engineering (QE) function.

1.3 Applicability. This instruction is applicable to S&MA personnel that perform a QE function for projects and to Inspection and Test Area Team personnel.

2. DOCUMENTS

2.1. Applicable Documents.

1994 SAE-AS9100, **Quality Systems - Aerospace – Model for Quality Assurance in design, Development, Production, Production, Installation, and Servicing**

ANSI/ISO/ASQ Q9001-2000 Quality Management Systems-Requirements”

MIL-R-39032, “Packaging of Resistors”

MIL-PRF-55182, “General Specification for Fixed, Film, Nonestablished Reliability, Established Reliability, and Space Level Resistors”

MIL-STD-1686, “Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices)”

MPR 5000.1, “Purchasing”

MPR 7120.1, “Program/Project Planning”

MPR 8040.3, “Product Traceability”

MPR 8730.1, “Inspection and Testing”

MPR 8730.3, “Control of Nonconforming Product”

MSFC-HDBK-1453, “Fracture Control Program Requirements”

MSFC-STD-781, “Retention Criteria Electrical Contacts”

MSFC-STD-2594, “MSFC Threaded Fastener and Management and Control Practice”

MSFC-STD-2903, “MSFC Tailoring Guide for NASA-STD-8739.3, Soldered Electrical Connections”

MSFC-STD-2904, “MSFC Tailoring Guide for NAS 5300.4(3M), Workmanship Standard for Surface Mount Technology”

MSFC-STD-2905, “MSFC Tailoring Guide for NASA-STD-8739.4, Crimping, Interconnecting Cables, Harness, And Wiring”

MSFC-STD-2906, “MSFC Tailoring Guide for NAS 5300.4(3J-1), Workmanship Standard for Staking and Conformal Coating of Printed Wiring Boards and Electronic Assemblies”

MSFC-STD-2907, “Workmanship Standard for Printed Wiring Boards”

MWI 5330.1, “Evaluation of Contractors, Suppliers, and Vendors”

MWI 7120.1, “Program/Project Quality Plan”

NPR 8735.2, “Management of Government Safety and Mission Assurance Surveillance Functions for NASA Contracts”

QD-QA-004, "Quality Assurance Plan for In-House Manufacturing and Test"

2.2. Reference Documents.

None.

3. DEFINITIONS

a. Inspection. The examination or testing of supplies and services (including, when appropriate, raw materials, components, and intermediate assemblies) to determine whether they conform to specified requirements.

b. MSFC Inspection Team. The team within S&MA's Safety, Reliability, and Quality Assurance Department charged with receiving inspection, in-process inspection, final inspection, test monitoring, and shipping inspection outside the East and West Test Areas.

c. Mandatory Inspection Point (MIP). MIP is an inspection requirement that must be completed before further processing.

d. Monitor. Monitor is less than 100 percent surveillance of an operation, test, or other activity. The degree of monitoring is based on prior performance, familiarity with personnel, complexity of task, nature of data recording, and assignment of MIP's.

e. Non-Quality Sensitive. A term used to identify equipment, hardware, software, or material not directly related to flight systems (e.g., mock-ups, development hardware and software, industrial machinery, laboratory equipment).

f. Quality Engineering. Refers to the quality function that pertains to establishing quality requirements for but not limited to mandatory inspections, delegations, procurements, designs, projects, and audits. This function is performed by designated S&MA personnel (civil service and mission services contractor).

g. Qualified Manufacturers List (QML). A list of manufacturers who have had their products examined and tested and who have satisfied all applicable qualification requirements for that product.

h. Qualified Products List (QPL). A list of products which have been examined, tested and have satisfied all applicable qualification requirements.

i. Qualifying Agency. The agency responsible for developing the specification (e.g., MIL, NASA) and assuring compliance by maintaining a list of manufacturers/suppliers qualified to the specification. The requirements for qualification are usually defined within the specification.

j Test Area Team. The team within S&MA's Safety, Reliability, and Quality Assurance Department charged with monitoring activities in the Technology Evaluation Department and the Facilities Office.

k. Verify. Review of recorded data (inspection, test, etc.) for conformance to established requirements (e.g., specifications, drawing requirements.)

l. Witness. Observation of a test or process to verify that the correct procedures and processes were followed for a specific action.

4. INSTRUCTIONS

4.1 Quality Planning. Quality plans shall be approved for projects prior to entering the implementation phase in accordance with MPR 7120.1 and MWI 7120.1. Quality plans shall include the detailed implementation requirements based on the project requirements. A restatement of how MSFC does business for quality elements addressed by existing MSFC directives or procedures is not required. When possible, the quality plan shall include generic requirements for procurement quality requirements, receiving inspection, in-process inspection, test monitoring, and shipping. The quality engineer will use the reliability and system safety documentation (Failure Modes and Effects Analysis/Critical Items List and Hazards Analysis Reports), as appropriate, when developing quality assurance planning documents to assure all critical attributes are identified for verification. Quality plans shall be prepared in accordance with the standard quality plan template found at https://masterlist.msfc.nasa.gov/mpdms/templates/Quality_Plan_Template.doc except when the quality plan is included as part of the project plan, in which case, the template content shall be addressed. The template captures the requirements for quality plans from MSFC directives. Additional items shall be added as necessary to address unique project requirements, such as planning to utilize existing stock that may include material with expired shelf life, in which case the plan would address methods to recertify this material.
Anytime expired shelf life material is discovered in manufacturing stage including kitting /layout inspection and subsequent stages, a discrepancy report shall be written unless the material is discarded and the material and appropriate cause and corrective action addressed by MRB. Quality plans shall include this requirement.

The Quality Plan shall address Software Quality Assurance (SQA) implementation requirements or include them by reference to a separate SQA plan.

4.1.1 Test Area Instructions. The Test Area Team shall implement the requirements of QD-QA-004 unless a specific quality plan is written. A project specific quality plan shall be written when deemed necessary, or if required by the project. The Test Requirements Document or Test Plan shall define the level of NASA quality coverage for the test article, or whether the customer will provide their own quality assurance. The standard quality plan template may be tailored as necessary for test projects.

4.1.2 Quality Participation in Design Reviews, Configuration Control Boards, and In-house Material Review Boards. Personnel that perform a QE function shall participate in design reviews, configuration control boards, and in-house material review boards as specified in Center procedures and instructions and applicable project documentation. Board membership for S&MA shall be limited to personnel holding Aerospace Technology (AST) positions. Non-AST personnel may support AST personnel and act on their behalf but shall not be board members. QD40/SR&QA Policy and Assessment Department personnel shall chair the Centerwide MRB

with assistance from Inspection Team and Project S&MA personnel as necessary. Program/project MRB membership shall be as specified in the program's or project's quality plan and appropriate project memo.

4.2 Drawing Review. Drawings and engineering parts lists shall be reviewed using the checklist contained in Appendix A.

4.3 Procurement Quality Requirements. Quality requirements for procurements shall be included with purchasing documents and shall bear the typed or printed name and signature of the quality engineer (QE) or the authorized S&MA employee or the signature may be provided electronically if a system which has controlled electronic signature capabilities is used. Requirements that must be verified at receiving inspection shall be included with the procurement quality requirements. **Where appropriate and beneficial to NASA/MSFC**, quality system requirements levied on contracts shall include requirement for suppliers to comply with SAE-AS9100. This does not preclude specifying ISO 9000 when deemed appropriate. Quality system requirements should not be specified for purchases of readily available items. A list of recommended procurement quality clauses is provided in Appendix B. Other clauses may be developed as required.

4.3.1 As a minimum, Certificates of Compliance (CoC's) are required for MSFC purchased items unless the quality can be adequately validated by test and/or inspection at MSFC receipt.

4.3.2 Prior to assigning quality requirements to electrical, electronic, and electro-mechanical (EEE) parts procurements, the QE or the authorized S&MA employee shall verify that the EEE Parts Packaging and assembly branch (EI42) has approved the as-designed parts listing in writing. The requiring organization must present written approval from EI42 of their as-designed listing, which includes the items to be procured.

4.3.3 If acceptance is dependent upon a test performed by MSFC at receipt or by the supplier [e.g., functional test, particle impact noise detection (PIND) and X-ray, destructive physical analysis (DPA)], then this must be determined in conjunction with the design engineer and other groups as necessary (i.e., EEE Parts or other test organization) and included as part of the procurement.

4.3.4 Details of how suppliers will be evaluated and approved shall be included in the Quality Plan. The QE or the authorized S&MA employee in conjunction with the project is responsible for determining when supplier audits are required and for having them performed. The QE or the authorized S&MA employee shall assess the need for supplier audits in light of the item's complexity, cost, potential for latent defects and planned inspections and testing. When necessary, the QE or the authorized S&MA employee shall obtain initial supplier evaluation information in accordance with MWI 5330.1. Completed vendor evaluation forms shall be forwarded to the Quality Assurance Records Center in building 4705 for retention. Typically, supplier audits are required when a new design is manufactured to a MSFC or supplier controlled drawing.

4.4 Receiving Inspection. The MSFC Inspection Team shall verify that all requirements imposed on procurements have been met including but not limited to proper CoC, count, condition, and satisfactory acceptance data package contents, where applicable. For EEE parts, receiving inspection shall consist of inspection for external defects and part marking. In addition to these requirements, all receiving inspection requirements and instructions unique to a specific procurement shall be clearly documented on the procurement request except for credit card purchases.

4.5 In-process Requirements. The QE or authorized S&MA employee shall evaluate designs to determine if there are attributes of the design that are critical to the safe operation of the system (in conjunction with safety engineering) or the item's function. If these attributes cannot be inspected at a final inspection point then the QE or authorized S&MA employee shall specify mandatory in-process inspection requirements for the MSFC Inspection Team or the Fabrication Services Contractor in the Quality Plan or in a referenced document when inspection beyond the norm is required.

4.6 Test Monitoring. Unless otherwise specified, the MSFC Inspection Team or Test Area Team shall monitor all qualification and acceptance tests of MSFC quality sensitive hardware at MSFC. The QE or the authorized S&MA employee and the MSFC Inspection Team or Test Area Team shall agree upon the level of monitoring beyond the minimum requirements of 4.6.1 and when monitoring is required for development tests conducted outside the East and West test areas. Where MSFC is providing a test service for customer hardware, the QE or the authorized S&MA employee shall reach an agreement with the customer, the MSFC lead organization, and when applicable the MSFC Inspection Team/Test Area Team regarding quality test monitoring. This agreement shall be documented and included in the Customer Supplied Product Agreement.

4.6.1 Minimum Monitoring Requirements for Qualification and Acceptance Tests. Unless otherwise specified by the Quality Plan, the MSFC Inspection Team/Test Area Team shall perform the following for in-house qualification and acceptance tests:

a. for NASA hardware or as required by the customer, verify test article configuration is defined by approved drawings including release of floor engineering orders (FEO's) for acceptance tests, that open items are not a constraint to test, and instrumentation is calibrated. Customer owned test articles shall be controlled per Test Requirements Document/Test Plan/Customer Agreement.

b. for NASA hardware or as required by the customer, assure configuration and identity of test article is maintained throughout the test. Customer owned test articles shall be controlled per Test Requirements Document/Test Plan/Customer Agreement.

c. assure tests are conducted as described by approved test procedures.

d. assure that changes to the test procedure are properly documented and approved per established requirements and that they do not violate the specification of the item under test, the Quality Plan, or the project plan.

e. monitor testing during data recording to verify that the applied test conditions (e.g., vibration, thermal) are within specified limits and the item under test is functioning within the required range when applicable. Signify monitoring by stamping and dating the data sheets/test procedure.

f. assure that anomalies during testing are documented and resolved in accordance with established procedure (e.g., MPR 8730.3).

g. assure that tests and inspections resulting from investigations of a failed condition are properly identified, recorded, and performed to the extent authorized.

4.7 Shipping Inspection. Prior to shipment of quality sensitive hardware from MSFC, the MSFC Inspection Team shall verify that the acceptance data package (ADP) meets project requirements, the as-built hardware configuration is documented and reserved Engineering Orders (EO's)/FEO's are released, and the item is packaged properly. When additional requirements are needed, the QE or the authorized S&MA employee shall provide them as an attachment to the shipping request (MSFC Form 57). The QE or the authorized S&MA employee shall include additional or generic shipping requirements in the Quality Plan when possible.

4.8 Delegation of Quality Requirements. The authority to delegate inspection requirements to other MSFC organizations resides with the Director, Safety and Mission Assurance Directorate (refer to MWI 7120.1). The Defense Contract Management Agency (DCMA) may be delegated quality functions by issuing a contract letter of delegation (LOD) on NASA Form 1430A. An LOD may also be issued through a contracted inspection agency and/or in-house contracted quality organization (e.g., the supplier assurance contract (NAS5-99200) administered by Goddard Space Flight Center.) The QE or the authorized S&MA employee shall pre-coordinate issuance of LOD's with the performing organization to ensure the requirements are understood and can be implemented. All LOD's must be submitted to the NASA Contracting Officer for administrative implementation into the applicable contract. The guidelines for preparation of LOD's are contained in NPR 8735.2. Specific requirements are provided below.

4.8.1 LOD's shall contain specific instructions for identifying mandatory requirements or provide the mandatory characteristics or operations (requirements) for verification/monitoring/witnessing/inspecting.

4.8.2 LOD's shall include when applicable the personnel qualifications required to perform the tasks involved.

4.8.3 LOD's shall include requirements for the delegated agency to verify the validity of contractor inspection and test data and to indicate, by stamping, each characteristic or operation inspected/monitored.

4.8.4 LOD's are not required when the quality of the end item can be satisfactorily determined

by inspection at the destination or by objective evidence provided by the supplier.

4.8.5 LOD's shall not be made on non-quality sensitive hardware except by special request or requirement by Project or S&MA management.

5. NOTES

This issuance replaces QD-QE-001G, dated March 28, 2005.

6. SAFETY PRECAUTIONS AND WARNING NOTES

None.

7. APPENDICES, DATA, REPORTS, AND FORMS

Appendix A, "Drawing Review Checklist"
Appendix B, "Recommended Procurement Quality Clauses"

8. RECORDS

Record	Repository	Period of Time
Inspection Requirements provided to MSFC Inspection Team and Test Area Team that are not included in one of the records below	QD10/20/30/40 as applicable	Retain until disposition notification is received from Project Office or associated hardware (including spares) has no potential for reflight or reuse; then retire to FRC.

The table below lists records referenced in this instruction that are retained in accordance with the requiring document.

Record	**Requiring Document**
Letters of Delegation	MPR 5000.1
Quality Plans	MWI 7120.1
Procurement Quality Requirements	MPR 5000.1
Completed Vendor Evaluation Forms	MWI 5330.1
MRB Dispositions on Discrepancy Records	MPR 8730.3

9. TOOLS, EQUIPMENT, AND MATERIALS

None.

10. PERSONNEL TRAINING AND CERTIFICATION

S&MA personnel that perform a QE function shall be trained to this document.

11. FLOW DIAGRAM

None.

Appendix A

DRAWING REVIEW CHECKLIST		
#	Item	Requirements and Guidelines
	General	
1.	Clarity	Check drawings and engineering parts lists (EPL's) to ensure they are clearly written and drawn, and subject to only one interpretation.
2.	Specification call-outs	Ensure parts, materials, and processes are indicated on the drawing or parts list where appropriate. Drawing notes or the body of the drawing may detail the design specification. When applicable, ensure that material and process specification call-outs include type, class, or applicable identifiers. Assure that specifications are the correct revision.
3.	Drawing notes	Notes that involve inspection shall include or reference acceptance criteria. Assure all flagged notes are indicated in the body of the drawing.
4.	Drawing revisions	Assure all drawing revisions include the description of the change. Verify the change has been incorporated into the revised drawing which is correctly dated.
5.	Tolerances	Assure dimensional tolerances are specified for all drawing numeric dimensions and geometric angles.
6.	Traceability	Assure program/project traceable items and/or assemblies are identified as traceable on the drawing and parts list as required by MPR 8040.3. Assure piece part/assembly serialization identification requirements are specified on the drawing.
7.	Identification	Ensure all parts on the engineering parts list are identified by a part number or part specification and quantities or usage requirements are listed (e.g., 3 ea., A/R (as required)). Assure the parts and materials necessary to fabricate the item are identified on the EPL and that this agrees with the drawing. Ensure that reference designators used on the assembly drawing are used consistently on all associated drawings and related lists.
8.	Marking	Ensure all part marking is shown in the body of the drawing or documented in the drawing notes. Ensure part marking materials are specified. Ensure marking requirements are consistent (e.g., for printed wiring master, drill and trim, and assembly drawings.)
9.	Log Books	If log books are required ensure the procedure or instruction is specified in the drawing notes. Refer to MWI 8730.1.
	Mechanical	
10.	Welding	Ensure weld joint types are shown on the drawing or are detailed in the drawing notes. Welding inspection requirements shall be specified.
11.	Fracture Critical	Ensure fracture critical hardware is identified on the drawing as specified in MSFC-HDBK-1453 to meet traceability requirements.
12.	Torque	Ensure torque requirements are specified for fasteners. Locking fasteners shall have running torque specified.

Appendix A

DRAWING REVIEW CHECKLIST		
#	Item	Requirements and Guidelines
13.	Fastener Installation	Ensure fasteners such as rivets and inserts have installation requirements specified.
14.	Surface Finish	Surface texture (roughness) must be completely defined.
15.	Cleanliness	Ensure piece parts are cleaned as required **prior** to assembly, dry film lubrication, insert installation, and any bonding operations (e.g. staking, threadlocking, adhesive bonding or coating).
16.	NDE	Ensure that the specification referenced on the drawing provides inspection requirements with accept/reject criteria or that the criteria are included in the drawing notes.
	Electrical	
17.	General	Ensure that for printed wiring assemblies (PWA's) a drill and trim drawing, a printed wiring master, a schematic and an assembly drawing are provided.
18.	Reference Designator	Ensure that reference designators specified on the drawing match the EPL and that traces or other parts of the drawing do not obscure them.
19.	Polarization	Ensure polarization keying is specified when applicable (e.g., connector). Ensure polarity/orientation is specified where applicable.
20.	Staking	Ensure that the type and location of staking material is specified. Glass bodied parts must have a resilient material (i.e. plastic sleeving) between the part body and epoxy staking material. All tantalum capacitors must be staked. Staking material application must be in compliance with MSFC-STD-2906.
21.	Soldering	Solder should be specified per MSFC-STD-2903/2904 (SMT) or a project approved equivalent.
22.	Cabling	Cable fabrication and crimping should be per MSFC-STD-2905 or a project approved equivalent.
23.	Wiring	Ensure that wires are properly identified by size, specifications, and coding.
24.	Sleeving	Ensure that sleeving is properly identified. Sleeving should be shown over connections where a possibility of shorting exists. When epoxy staking is used, ensure that all glass bodied devices are sleeved.
25.	Conformal Coating and Staking	Ensure all flight PWA's are cleaned, demoisturized, and conformally coated in compliance with MSFC-STD-2906. Ensure all tantalum capacitors are staked.
26.	Printed Wiring Boards (PWB)	PWB's should be specified per MSFC-STD-2907 or a project approved equivalent.
27.	PWB Coupons	Ensure microsectioned coupons are required for all multi-layer PWB's. Delivery of microsectioned coupons of double-sided PWB's is not typically required. Two microsectioned coupons must be delivered for

Appendix A

DRAWING REVIEW CHECKLIST		
#	Item	Requirements and Guidelines
		each panel of multi-layer PWB's manufactured. One coupon must be thermally stressed per MSFC-STD-2907 and the other coupon must be in the as-manufactured condition.
28.	Electrical Test	Drill and trim drawings shall require 100% electrical test for opens and shorts for each PWB. If surface mount pads are present, then a dual axis test is typically required to ensure 100% function.
29.	Cleanliness	On assembly drawings, ensure that all solder joints can be cleaned (excluding solder sleeves). All PWA's must be cleaned and demoisturized prior to staking and conformal coating.
30.	Retention Tests	For connector contacts that use retention clips or tines, assure that 100% push or pull tests are specified for contact seating verification per MSFC-STD-2905 or MSFC-STD-781.
31.	Cable Ties	Ensure that cable drawings specify attachment of securing devices (i.e. plastic straps) on both sides of a breakout per MSFC-STD-2905. Ensure the drawing specifies attachment of individual wires to each other through means such as spot ties, sleeving, or lacing in compliance with MSFC-STD-2905 to prevent separation. For assembly drawings, ensure that locations of mechanical attachments are specified on the drawing.
32.	Cable Tests	Ensure the drawing requires cable and harness continuity, isolation resistance, and dielectric withstanding voltage testing in compliance with MSFC-STD-2905.

APPENDIX B PROCUREMENT QUALITY CLAUSES

These clauses have been developed to reflect compliance to requirements in AS9100, Quality Systems – Aerospace – Model for Quality Assurance in Design, Development, Production, Installation and Servicing. As such, the following terms are used to reflect vocabulary used in that document. The definitions are paraphrased for ease of understanding in this document.

Customer – The entity buying a product or service. In this case MSFC

Organization – The entity supplying a product or service directly to the customer

Supplier – Previously referred to as "Subcontractor", an entity supplying product or service to the organization, to become all or part of a product or service ultimately supplied to the customer

NOTE: Clauses with an alpha suffix, such as 30A, 30B, etc. are MSFC specific and are retained from previous revisions of this document.

Appendix B

RECOMMENDED PROCUREMENT QUALITY CLAUSES

Clause #	Description	Basic Clause Language	Guidance
AQC01	Material Identification, Damage & Count	Each article delivered under this Purchase Order will require positive identification with the part number ordered. All purchased materials and services are subject to inspection for compliance to this purchase order and all applicable quality clauses. No material or process substitutions, quantity variations or splits from the purchase order may be made without prior written authorization from the Customer.	This Clause may be used in lieu of C of C requirement for purchasing Commercial-Off-The-Shelf (COTS) supplies that are not critical in nature, like photo copy paper, or other similar supplies. This information may also be included in the purchase order terms and conditions section.
AQC02	Quality System	When Specifying Compliance to AS 9100 The organization shall have a quality program that complies with International Organization for Standardization document SAE, AS9100 - Model for Quality Assurance in Design/Development, Production, Installation, and Servicing. Third party certification / registration is not required. If Customer has accepted Organization's AS9100 registration and Organization subsequently changes registrars, loses its registration status, or is put on notice of losing its registration status, it shall notify Customer's procuring Component(s) within three days of receiving such notice from its registrar. When specifying Compliance to ISO 9000 The organization shall have a quality program that complies with International Organization for Standardization document ISO9000 - Model for	For organizations designing, manufacturing, and or conducting critical ground and/or flight operations of space flight components, sub-assemblies, and assemblies the provisions of AS9100 should be used. For organizations providing support services that could affect the mission success of a program or mission ISO 9000 should be used. For organizations providing piece parts, and/or individual items manufactured to a specification/standard, necessary provision shall be individually established to assure the quality of the product that is received. Suggested Deliverable Submittal: A Copy of the Quality System Plan.

Appendix B

RECOMMENDED PROCUREMENT QUALITY CLAUSES

Clause #	Description	Basic Clause Language	Guidance
		Quality Assurance in Design/Development, Production, Installation, and Servicing. Third party certification / registration is not required. When Awarding a Contract to a ISO 9000 or AS 9100 Registered Organization If Customer has accepted Organization's third party quality registration and Organization subsequently changes registrars, loses its registration status, or is put on notice of losing its registration status, it shall notify Customer's procuring Component(s) within three days of receiving such notice from it's registrar.	
AQC03	Right of Access	Work under this purchase order/contract is subject to government or customer surveillance/inspection at organization's plant or sub-tier supplier's facility. The organization will be notified if a surveillance/inspection is to be conducted.	To be used when source inspection has not been specified. No shipments are to be held for government or customer inspection unless notification is received by the organization prior to shipment. Reference FAR 46 http://farsite.hill.af.mil/reghtml/regs/far2afmcfars/fardfars/far/46.htm. This requirement may be included as part of the contract terms and conditions.
AQC04	Flow Down Requirements	All applicable requirements that are invoked or applied to the customer's purchasing document, including this clause, shall be flowed down to the organization's sub-tier suppliers.	This clause is imposed when a Quality system is not flowed down to the organization or the sub-tier supplier. The organization shall determine the applicable requirement for flow down based on the procured product, process or service. This requirement may be included as part of the contract

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RECOMMENDED PROCUREMENT QUALITY CLAUSES

Clause #	Description	Basic Clause Language	Guidance
			terms and conditions.
AQC05	Certificate of Compliance (C of C)	Organization shall provide a certification with each shipment to attest that the parts, assemblies, subassemblies, or detail parts conform to the Order requirements. When applicable, the true manufacturers, lot, heat, batch, date code, and/or serial number must appear on the certification. Certification must contain the following: Customer's Order number, Line number, Part number, Name and address of manufacturing or processing location, Manufacturer's lot, heat, batch, date code, and/or serial number (if applicable), Quantity and unit of measurement (each, box, case, gallons, etc.), Be signed and dated by an official of the company. The applicable material test results, process certifications and inspection records shall be presented upon Customer's request. Organization shall perform inspection, as necessary, to determine the acceptability of all articles under this Order. All articles submitted by Organization under this Order are subject to final inspection at Customer's plant.	When reviewing a C of C, the organizations or suppliers format should be considered acceptable as long as it contains the information noted in the clause. Reference FAR section 52.246-15 http://farsite.hill.af.mil/reghtml/regs/far2afmcfars/fardfars/far/52_246.htm#P258_51075. When acceptance is being made by the government, additional provisions of certification of conformance may apply. Reference FAR section 52.246-15
AQC06	Certificate of Compliance Raw Materials	The organization will include with each shipment the raw material manufacturer's test report (e.g., mill test report) that states that the lot of material furnished has been tested, inspected, and found to be in compliance with the applicable material specifications. The test	This clause may be applied when procuring raw material from a distributor or raw material manufacturer. Raw materials include items such as aluminum / steel sheet, rod, and bar stock; plastics (i.e.:Teflon).

Appendix B

RECOMMENDED PROCUREMENT QUALITY CLAUSES

Clause #	Description	Basic Clause Language	Guidance
		report will list the specifications, including revision numbers or letters, to which the material has been tested and/or inspected and the identification of the material lot to which it applies. When the material specification requires quantitative limits for chemical, mechanical, or physical properties, the test report will contain the actual test and/or inspection values obtained. For aluminum mill products (except castings), certifications for chemistry may indicate compliance within the allowed range. Certifications for physical properties will show actual values. When organization supplies converted material produced by a raw material manufacturer, the organization shall submit all pre and post conversion chemical / physical tests reports.	When actual test results are desired, e.g. flight hardware or critical GSE. When reviewing a raw material test report, the organizations or suppliers format should be considered acceptable as long as it contains the information noted in the clause. Suggested Deliverable Submittal: A copy of the C of C.
AQC07	Certificate of Compliance (C of C) - Calibration	The organization shall submit for each item calibrated, one reproducible record of actual calibration results, including applicable graphic and tabular data. Records shall be traceable to the individual item tested, by part number, serial number and customer's order number for the item shipped. The organization's calibration certificate shall include a unique calibration tracking number, tolerance range, and when applicable, environmental conditions for each parameter calibrated. The certificate shall also state the operating	When contracting for product or services when verification of the calibration of the equipment is important, then this clause should be used. Examples include sending equipment out to it's manufacturer for calibration, or the calibration of a standard. Do not use this clause, if having a cal sticker on the equipment is sufficient. If you are requesting a certification of calibration with your procurement, you should also be specifying that the organization has a calibration system (Reference ISO 17025).

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		error per specification, the degree of correction of out of tolerance condition and remaining uncorrected out of tolerance condition, if applicable.	Suggested Deliverable Submittal: A copy of the C of C.
AQC08	Special Process Certification	A special process certification shall be provided with each shipment of item(s) delivered on this contract. Special Process Certifications may be in supplier format and shall include the following: • Customer's Order number • Part number(s) • Serial and/or lot numbers, of the hardware processed (if applicable,) • Material process specification & revision • Objective evidence demonstrating compliance with the applicable process, (i.e. temperature charts and • Hardness test results for heat treatment, destructive test results, etc.....) • A certification stating the special process was performed per the applicable drawing/specification requirements. • Organization 's name and address When special processor is other than the Organization, provide a certification of compliance from the special processor stating the special process was performed per the applicable drawing/specification requirements. Certifications must include the processor's name, address and be signed and dated by a company official.	Special Processes is defined as any process for production and service provision where subsequent monitoring or measurement cannot verify the resulting output. This includes any process where deficiencies become apparent only after the product is in use or the service has been delivered. Examples may include, but are not limited to, Heat Treat, Non Destructive Test, chemical or metallic coatings (e.g.: anodize, passivation), welding, unique or uncommon processes. The organization may elect to impose the following additional requirement within their flow-down contracts: When imposed elsewhere within the contract, only Customer approved Processor(s) shall perform certain special processes. A list of Customer approved processors is available from Customer's authorized purchasing / subcontract representative. Processors not listed in the Customer approved processors list must be surveyed and approved by Customer prior to performance of the process. Requests for processor surveys will be submitted to Customer's authorized purchasing / subcontract representative.

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		Each certification must be signed and dated by a company official of the Organization and/or Processor attesting to the acceptance of the processes performed to the required specification(s). The supplier shall retain all records associated with the selection and approval of supplier approved special process providers. Per contract or regulatory agency requirements, these records shall be made available to the Customer and/or regulatory agencies upon request. The supplier shall notify the Customer prior to destruction of records relative to this contract. The Organization shall insert the substance of this clause, including this sentence, in all lower-tier subcontracts for work performed under this contract.	
AQC08 A	Welding	The supplier shall submit the welding process procedure documentation as required by the contractual welding specification.	1. The supplier shall submit weld qualification procedure records as required in the contractual welding specification. The weld qualification procedure shall be traceable to the welding process procedure.
AQC08 B	Weld Filler Metal	The supplier shall submit the following: mill certification of the weld/wire chemical analysis, identification (stamped, tagged, or equivalent) of alloy for each weld rod, and identification of manufacturer, heat number, size, weight, and specification material type on each container or reel/spool.	1. Prior to usage and when required by process or filler metal specification, applicable chemical, mechanical, weldability, etc., properties must be verified through tests on each shipment or lot (heat treat) of weld rod and reel/spool. 2. Each weld rod shall be verified to be the specified material alloy prior to use. A unique identification must be place at the lowest level of control (i.e., wire, package, tube, etc.) to assure traceability of the 100% material alloy

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			verification tests. 3. Filler metals shall be stored in original sealed containers until immediately prior to use or test. ***NOTE: the above requirements may be levied on the supplier or the procuring activity.***
AQC09	Calibration System	The organization shall have a documented calibration system that meets the requirements of ISO 10012, Quality assurance requirements for measuring equipment, or the American National Standard Institute (ANSI)/National Conference of Standards Laboratories (NCSL) Z540-1, General Requirements for Calibration Laboratories and Measuring and Test Equipment.	This clause shall be imposed to assure the organization has a compliant calibration system in place to control and validate measuring and test equipment used to assure deliverables meet prescribed customer requirements.
AQC10	Change Authority	Organization shall be responsible for controlling / tracking changes to parts and components manufactured to ensure that the end product meets specified design functional and physical characteristic requirements. This includes any part or component manufactured to Customers' or vendors' drawings, specifications, or special process procedures. The organization and the customer shall document the agreements as to the extent of organization internal and formal customer involvement configuration management to be applied to this contract / purchase order. At a minimum, with each shipment, Organization shall submit configuration documents, which define the requirements, designs, build /	Configuration management should be specified to the extent appropriate for the product and/or service being contracted. The main criterion is to select those items whose performance parameters and physical characteristics can be separately managed to achieve the overall end use performance of the item. Other selection criteria, which should be applied, are: Criticality in terms of high risks, safety, mission success, etc: New or modified technology, design or development; Interfaces with other items; Procurement conditions; Logistic and maintenance aspects. For products and services involving detailed configuration

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		production and verification for a configuration controlled item. This record shall be signed and dated by an official of the Organization's Quality Assurance department, and in addition to the aforementioned required information, shall include the following minimum requirements: Organization's Contract / Purchase Order number Line item number Part number (Of deliverable item and all traceable/repairable sub-tiered parts) Serial number (Traceability as required per contract/purchase order) Lot number (Traceability as required per contract/purchase order) Drawing number (For Drawings related to deliverable item and all traceable/repairable sub-tiered parts) Revision level (baselined configuration of drawing to which hardware was built) Engineering order(s) (or equivalent drawing changes as applicable) Customer approved deviations and waivers (as applicable)	control requirements the contract should specify implementation of a fully developed configuration management system, reference ISO 10007 as guidance. For products and services that do not require an extensive configuration management system the above noted clause should be used to define minimum configuration management requirements. Examples where this clause might be used in lieu of ISO 10007 guidance include prototype parts, non-critical/non flight hardware/software, COTS hardware/software, products/services provided by small suppliers. For products and service that involve software, configuration management requirements for software shall also be identified. Deliverable submittal: Plan
AQC11	Change Authority	The Organization shall provide in writing advance notification to the Customer of any change(s) to tooling, facilities, materials or processes at the Organization or the Organizations sub-tier that could affect the Customers contracted product. This includes,	This clause is used when any of the listed conditions are critical to product quality. This clause may be part of standard terms & conditions.

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		but is not limited to, fabrication, assembly, handling, testing, facility location or introduction of a new sub-tier supplier	
AQC12	Critical Processes	The following shall apply to customer designated critical processes performed by the organization: The organization will notify the customer of proposed changes in process definition and, will obtain approval from the customer prior to implementing the change. Changes affecting processes, production equipment, tools and programs shall be documented. Procedures shall be available to control their implementation. The following shall apply to organization designated critical processes that have been sub contracted: The supplier will notify the organization of proposed changes in process definition and, will obtain approval from the customer prior to implementing the change. Changes affecting processes, production equipment, tools and programs shall be documented. Procedures shall be available to control their implementation	Numerous processes performed to support build of flight hardware can have critical characteristics, and/or be considered a specialty process. However, based on experience, knowledge, and risk considerations, some processes require an additional level of review and control. These are Designated Critical Processes. Designated Critical Processes are to be uniquely identified on the print, process specification or similar documentation and should be traceable to manufacturing operations. Designating a process as critical may drive cost and impact schedule and this designation should be reserved for those processes, which have been determined to have high risk and would benefit from such a designation. Use of this clause should be coordinated with the contractor prior to use. Deliverable submittal: Process Procedures & Proposed Changes
AQC13	Government Source Inspection (GSI)	All work on this Purchase Contract is subject to inspection and test by the Government at any time and any place. Government inspection is required on this	Each procurement situation should be evaluated based on the unique attributes involved. Decisions to specify Government Source Inspection (GSI) on contracts should include, but are

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		order prior to shipment from Organization's facility. Government inspections performed will be determined by the delegated Government inspection representative and may be conducted during processing, fabrication, or final inspection. Upon receipt of this Purchase Contract, promptly notify the Government representative who normally services your plant so that appropriate Government inspection planning can be accomplished. If your facility is not serviced by Government inspection and/or the area Government inspection representative or agency cannot be located, immediately notify Customer. NOTE: Do not proceed with fabrication/manufacture processing until Government mandatory inspection points (GMIPs) are added to Organization's manufacturing planning. GMIPs shall not be by-passed unless authorized in writing by the Government inspection representative. Organization shall request and include the documents specified in the Government delegation, in the shipment. The Government's request for source inspection shall specify the period and method for the advance notification and the Government representative to whom it shall be furnished. Request shall not require more then 2 workdays of advance notification of the Government representative is in residence in the Contractors plant, nor more then 7 workdays in other instances. Organization, without	not limited to the following considerations: · Inspection Type: Supplies, Services, Research and Development, Construction · Contract Type: (Fixed Price, Fixed-Price with Retroactive Price re-determination, Fixed-Price Incentive Based or Cost Reimbursement) · Identification of Contract delivery Risks · Analysis of each Risk Impact related to Safety, Cost, Schedule, and Performance Support requirements, operating channels and procedures, and any other requirements must be thoroughly understood prior to transmitting official Letters of Delegation and/or task orders. The information provided within these requirements can apply to Safety and Mission Assurance (S&MA) for subcontracts as well as the prime contract. When there are multiple delegations and/or tasks (including those from other government locations) at a contractor's facility, duplication of effort must be eliminated where possible. The following considerations should also be included when using the formal risk management process in planning the S&MA surveillance functions: a. Contract, subcontract, and purchase order quality requirements. b. End-use criticality of suppliers and services. c. Current procedures and general operations, particularly those applicable to supplies and services similar to those being procured.

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		additional charge to the procurement document, shall provide all reasonably required facilities and assistance (applicable drawings, specifications, change orders, inspection and/or test equipment) for the US Government representative to perform their duties. Organization shall ensure that Government inspection acceptance is evident for every individual GMIP and that completion of Government inspection is evident on Organization's shipping document/packing list. Evidence may be the signature of Government inspection representative with printed name and office, or application of the representative's stamp. The Government shall accept or reject supplies as promptly as practical after delivery, unless otherwise provided in the contract. Government failure to inspect and accept or reject the supplies shall not relieve the Contractor from responsibility, nor impose liability on the Government, for nonconforming supplies. When manufacturing processing affected by GMIPs is subcontracted by Organization, the provisions of this Clause shall be included in the Organization's Purchase Order verbatim.	d. Technical direction to be given to the contractor. e. Functions to be delegated or tasked and the performance desired. f. Proposed support, including special skills. g. S&MA functions to be accomplished at the contractor's facility by Government personnel. h. Channels of communication. i. Review of past S&MA history of the contractor, results of delegated agency S&MA program evaluation of the contractor and contractor's programs (quality assurance, risk management, etc.), known contractor's S&MA program deficiencies, and contractor's progress in correcting deficiencies. j. Unique training and certification requirements. k. Redelegation and flow down of requirements (as applicable). l. Interface situations arising from partial delegations or other delegations in the same facility. m. Response time for mandatory inspections Each procurement situation should be evaluated based on the unique attributes involved Reference FAR 46.3 and 46.4 http://farsite.hill.af.mil/reghtml/regs/far2afmcfars/fardfars/far/46.htm

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AQC14	Contractor Source Inspection (CSI)	Customer source inspection is required prior to shipment of articles from the Organization's facility. Upon receipt of this Order and prior to commencing work, promptly notify the Customer's Procurement Quality Assurance Representative (PQAR) assigned to the Organization's facility so the appropriate inspection plan can be coordinated. In the event that a Procurement Quality Assurance Representative does not normally service the Organization's facility, immediately notify the Customer Procurement representative to obtain a point of contact for the appropriate Procurement Quality Assurance Representative (PQAR) assignment. Source inspection shall be conducted by the Customer at the Organization's facility or where designated in the Order. The Organization shall notify PQAR office a minimum of five (5) working days in advance of the time the articles or materials are ready for inspection or test. The Organization shall make available to the PQAR all applicable drawings, specifications, procedures, statements of work, Customer's Order, test software, and changes thereto, related inspection and/or test equipment, and such other information as may be required to satisfactorily perform the inspections and	This clause should be used when the decision, for any number of reasons, has been made to inspect at the organization's facility.

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		tests required under this Order.	
AQC15	First Article Inspection	Organization is required to perform 100 percent inspection and record the attributes for the first article of this Contract / Purchase Order, and shall be in accordance with AS9100 and AS9102. If the deliverable is an assembly, this inspection shall also include all of the piece parts that make up the assembly. The inspection records and data shall be per AS9102 and shall identify each characteristic and feature required by design data, the allowable tolerance limits, and the actual dimension measured as objective evidence that each characteristic and feature has been inspected and accepted by the Organization's quality and inspection function. When testing is required, the parameters and results of the test shall be recorded in the same manner. The First Article Inspection Report must show evidence of acceptance by the Organization's quality assurance representative. The First Article(s) shall be produced on production equipment and using processes which will be utilized on production runs. Additionally, the Organization shall perform additional First Article Inspection(s) per the requirements of AS9102 (i.e.: following every major tooling, every design change, and subsequent to any evident quality degradation for a specified part or article). Records of all first article activity will be	First article inspection is typically required for instances when a production run will be performed and not all articles will be fully inspected. For design development programs, such as build of a single spacecraft, the inspection, test, and engineering verification that is conducted during design development meets the intent of a first article inspection. For these types of activities this clause should not be used. If you are imposing a first article inspection clause, one or more of the following should be specified (reference AS 9102): Sub a DELIVERY OF FIRST ARTICLE INSPECTION RECORDS: The Organization shall provide one (1) reproducible copy of the First Article records and First Article Records Report accompanied by variables data with the initial shipment. Sub b RETENTION OF FIRST ARTICLE: The Organization shall retain the first article(s) as objective evidence and make available to Customer upon request. Disposal of first article is prohibited until authorized by customer in writing. Sub c DELIVERY OF FIRST ARTICLE: The Organization is required to deliver the first article to Customer for verification, as part of the Contract / Purchase Order, prior to

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		documented as required in AS9102, treated as quality / acceptance records, and made available to Customer if requested.	the shipment of any balance of said Contract / Purchase Order, unless otherwise specified. Sub d SOURCE INSPECTION OF FIRST ARTICLE: Customers' source inspection to witness the first article inspection, or specific details as specified in this Contract / Purchase Order.
AQC16	Nondestructive Inspection (NDI) / Nondestructive Test (NDT) Certification	Organization will include with each shipment a certificate for the NDI/NDT performed. As a minimum, the certification shall contain the following information: · Customer's Purchase Order / Contract number · Name and address of the Company performing NDI/NDT; · Date of Inspection; · Quantity of parts tested by part number; · Specification or other requirement defining the NDI/NDT acceptance / rejection criteria; · Inspector/name/stamp and NDI/NDT certification level; · NDI/NDT specification including revision; · Material or item identification (part number, heat lot number, Foundry Record (FR) number; · Material or item traceability (serial number, lot number, batch number, lot/date code); · Inspection results (accept/reject);	When NDI/NDT is called out on a drawing or a specification. Examples include dye penetrant, X-ray, ultrasonic, PIND, eddy current, etc.

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		· Reference to previous NDI/NDT reports for repair/rework if applicable; · Reference to attached recordings i.e., films or photographs if applicable; A record of the procedures or techniques used and actual results shall remain on file for at least five years after shipment to Customer and shall be furnished to Customer upon request. These records shall include all information required in the previous paragraph as well as acceptance / rejection criteria, and related test instrument data used in the NDI/NDT process.	
AQC17	100% Attribute Clauses	The organization shall submit (1) reproducible copy of all inspection documentation stamped by the responsible quality inspector showing 100% inspection for all attributes noted on the drawings, for all parts submitted under this Contract/Purchase Order.	This might apply when purchasing machined parts to print, low volume, or when lot acceptance would not be applicable. Example: Typical report would be a CMM report.
AQC18	Limited Operating Life Items	Organization shall collect and maintain records of operating time or cycles for all items designated as Limited Operating Life Items by Customer's drawings or specifications. Records shall include the total elapsed time or cycle for each operation, cumulative time or cycles starting with the first functional test, and remaining time or cycles. A copy of this data shall be included with each shipment traceable to the individual item by part number and serial number.	Each procurement is to be reviewed to determine when data requirements for the status at time of delivery of accumulated operating time or cycle of parts designated as time or cycle critical is required. Examples are pressure vessels, flight connectors, batteries, mechanisms, and other similar items that have limitation on their operational use. Inclusion of the cycle time data record should be considered as part of the contract data item deliverable for the acceptance data package when the clause is imposed.

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			Deliverable submittal: When part of an Acceptance Data Package
AQC19	Limited Life and Age Controlled (Shelf Life) Items	Products on this Order require submittal of date of manufacture when shelf life is based on date of manufacture, or date of shipment from the manufacturer when shelf life is based on date of shipment, as appropriate, based on specified method of shelf life determination. Upon shipment, shelf life remaining shall meet the minimum shelf life specified on the order. If no shelf is specified, 75 percent of the shelf life shall be remaining on products on this order. Certification must contain the following: Customer's Order number Order part number Manufacturer's name, lot, heat, batch, date code, and/or serial number (as applicable) Date of manufacture Date of shipment from manufacturer (as specified on Order) Organization name, and Organization's point of contact Date	When the Customer may desire the Organization to provide evidence of certification to limited life and age controlled sensitive products. Examples include paints, epoxies, sealants, adhesives, thinners and activators. Definitions: Shelf Life: A predetermined period of time that a material or item retains its original characteristics and operational capacity and is further defined to encompass the Date of Expiration (DOE) and the time span from Date of Manufacture (DOM), Date of Shipment (DOS), Date of Receipt (DOR) or cure date to the installation or application date.
AQC20	Packaging	Organization's Quality Control organization shall be	Packaging requirements must be appropriate to the value and

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	Requirements	responsible for ensuring that items provided under this Contract/Purchase Order are packaged in such a manner that the dimensional integrity is preserved, contamination and corrosion are prevented, and no physical damage occurs or, when specified, that packaging is in accordance with the drawing, appropriate ASTM, MIL, or other applicable customer specified requirement.	configuration (i.e. physical fragility, size and shape) of each ordered item. Standard industrial practices are acceptable for low value/raw bulk or configured raw materials (i.e. pipe, bar stock, rod, etc). The manufacturer's packaging for commercial off-the-shelf (COTS) parts typically provide adequate protect for their product (e.g. computers, hand-held multimeters, test equipment). Special packaging shall be designated for electrostatic sensitive devices (ESD) and shall meet Mil-PRF-81705 requirements High-value and Build-To-Print items (i.e. electronic, electro-mechanical or optical) assemblies shall be packaged per Engineering design requirements if specified. Attention to ESD, foreign object damage (NAS412-FOD) and physical integrity must also be noted for all products. Reference NPR 6000.
AQC21	Packaging Handling & Labeling	The organization shall provide packaging that maintains the quality of the fabricated item and prevents damage, deterioration, substitution or loss in transit. The organization shall label the exterior of the	Packages shall be marked to identify specific handling and environmental protection requirements. All products that are ESD sensitive shall be properly labeled per MIL-STD-129.

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		package to ensure adequate identification of precautions needed to ensure the integrity of the product being shipped. The organization must specify the handling and shipping methods that ensure proper and on-time delivery without damage to the product. The organization shall ensure that special labeling requirements shall also be listed in the appropriate shipping documents and on each package.	Preservation techniques for products that require environmental protection shall be noted on the exterior of each package (e.g. temperature, stacking or lifting limitations; inert environments). Products that have specific cleanliness requirements shall be identified to ensure that product packaging is only opened in an appropriate, clean environment.
AQC22	Shipping Documents	Organization shall furnish Commercial Shipping Documents/Packing List, capable of being photographically reproducible through two additional reproductions, showing the following: • P.O. Number • Part Number(s) • Description • Qty ordered • Qty shipped • Lot/Date Code/serialization (as applicable) • Any handling constraints or cautions such as, but not limited to:	When this clause is specified, Packaging requirements clause is also needed. Consider special packaging requirements. This may also be included in the contract terms and conditions.

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		○ Optics; open only in clean room environments. ○ ESD sensitive items, open only at approved ESD workstation. ○ Moisture sensitive components, open/store only in humidity controlled area. ○ Shock sensitive components (shock monitoring should be specified if required.	
AQC23	Nonconformance Reporting	Customer grants no MRB authority to the Organization or it's sub-tier suppliers. Repair is not allowed. Definitions: Nonconformance: A condition of any article, material or service in which one or more characteristics do not conform to requirements specified in the contract, drawings, specifications, or other approved product description. Includes failures, discrepancies, defects, anomalies, and malfunctions. Rework: Used when an article can be made to conform	Requirements for providing data on nonconformances should be specified as a data item deliverable. Where possible, use of an organization's internal tracking and reporting system should be considered. This clause is intended to address nonconformance reporting, and the fact that MRB is not being delegated. This clause would Normally be used in a PO where flow down of a stand-alone problem reporting system requirement does not make sense on a piece part or component level flight hardware or GSE fabrication). This clause is not intended to be used on major supplier contracts. Request for MRB authority should be reviewed on a case-by-case basis.

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		to drawing requirements. Detailed instructions must be included or referenced. Repair: Used when the nonconforming article, material or service can be corrected to a usable condition, although its condition will not be identical with drawing / specification requirements. The organization shall ensure that product which does not conform to product requirements is identified and controlled to prevent its unintended use or delivery. The controls and related responsibilities for dealing with nonconforming product shall be defined in a documented procedure. The organization's documented procedure shall define the responsibility for review and authority for the disposition of nonconforming product and the process for approving personnel making these decisions. Data Requirements: Any nonconformance discovered by the organization, on products in their control, shall be documented by the organizations' approved method of nonconformance reporting. This shall include a detailed description of the nonconformance; location (by drawing reference point, hardware reference point, clock location, etc.); and exact callout of the violation by drawing or specification requirement (including sub-paragraph or illustration number). It shall also list	Deliverable submittal: Plan and NCR submittals

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		what type of inspection revealed the discrepant condition, and what, if any, subsequent actions were taken prior to disclosure. Dimensional violations shall include should be and is dimensions, and tool(s) calibration traceability numbers. Nonconformance Preliminary Review: The preliminary review process shall be initiated with the identification and documentation of a nonconformance. A preliminary review shall be the initial step performed by the organization to determine if the nonconformance needs to be reported to the customer (see below), and to determine if the nonconformance is minor and can be re-worked to a condition that completely conforms to the drawing or specification requirements. Note: preliminary review does not negate the requirement to identify, segregate, document, report and disposition nonconformances. Nonconformances shall be reported to the customer under the following conditions. When notification is required, notification shall be within 3 working days after the nonconformance is discovered. The problem is detected during one of the following: 1. Certification, acceptance, or qualification	

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		testing 2. Other significant test as specified by the customer 3. Turnaround, maintenance, overhaul, and repair of flight, ground test operation or shipping and receipt of hardware delivered to the customer including any test involving hardware previously accepted by the customer and returned for repair, modification, etc. And it is: 1. Flight hardware 2. Flight Hardware Spares 3. Equipment that is representative of flight hardware (flight-like hardware), including prototype and qualification hardware 4. Ground Support equipment (GSE) that is safety critical	
AQC23 A	MRB	The supplier is authorized to process article and material nonconformances using a Material Review Board to the requirements specified in the MSFC or contractor Quality Plan.	The following additional or alternate language may be used: 1. The contractor is authorized to delegate MRB responsibility to suppliers. 2. Copies of all nonconformance reports dispositioned by the Material Review Board (MRB) shall be submitted with delivery. 3. Nonconforming articles and materials returned to the supplier by NASA and subsequently resubmitted by the

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			supplier shall bear adequate identification of such resubmission either on the article or material or within the supplier shipping documentation. Reference documentation shall be made and submitted noting and including a closed out copy of the supplier's nonconformance report.
AQC24	GIDEP	The contractor shall participate in the Government-Industry Data Exchange Program (GIDEP) in accordance with the requirements of the GIDEP S0300- BT-PRO-010 and S0300-BU-GYD-010, available from the GIDEP Operations Center, PO Box 8000, Corona, California 91718-8000. The contractor shall review all GIDEP ALERTS, GIDEP SAFE-ALERTS, GIDEP Problem Advisories, GIDEP Agency Action Notices, and NASA Advisories to determine if they affect the contractors products/services provided to NASA. For those that affect the program, the contractor shall take action to eliminate or mitigate any negative effect to an acceptable level. The contractor shall generate the appropriate failure experience data report(s) (GIDEP ALERT, GIDEP S AFE-ALERT, GIDEP Problem Advisory) whenever failed or nonconforming items, available to other buyers, are discovered during the course of the contract.	Each procurement is to be reviewed to determine if participation in the Government-Industry Data Exchange Program (GIDEP) and NASA Advisory Program (NAP) is appropriate. The following factors should be considered in this determination: • Type of Procurement - consider the commodity being purchased; generally contracts involving the manufacturing, distribution, test, and/or operations of critical/complex space flight related hardware/software product or services should require GIDEP reporting. Other types of activities, such as an administrative service support contract, do not require GIDEP reporting. • Acquisition Phase - consider the phase of the program and the utility of t he GIDEP and NASA Advisory data to support that phase, generally

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			activities after the conceptual design phase can benefit most from participation. • Dollar Value of Contract - consider the amount of the contract and the benefit to be obtained from participation or the risks of not participating. There is no cost to contractors to participate in GIDEP - There is a cost to review and evaluate information. • Prime contractors often have internal alert systems that provide equivalent exchange of information. Under these circumstances the prime is responsible for flow – down of the equivalent reporting requirements to applicable sub-tier suppliers, and for assuring sub-tier supplier compliance with the requirements. Deliverable Submittal: Plan and GIDEP Disposition.
AQC25	Record Retention	Organization and Organization's Subcontractors shall maintain verifiable objective evidence of all inspections and test performed, results obtained and dispositions of non-conforming articles. These records shall be identified to associated articles, including heat	This requirement shall be flowed down to all levels of configuration managed item. Record retention is expensive, and use of this clause should be based on the future need of data retrieval, and the program risk associated with not having access to the documentation.

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		and lot number of materials, unit or lot serialization and made available to Customer and/or Government Representatives upon request and shall be retained in a safe, accessible location for a period of ten (10) years after date of delivery as defined in the contract. Organization's records associated with the manufacture of serialized or lot controlled articles will provide for continued traceability of serial numbers or lot number identification through all phases of manufacture, commencing with the raw material and continuing through final acceptance of the end item. Records held for the required retention period (ten years) shall not be destroyed without Customer's written concurrence.	The 10-year retention time has been identified as a default requirement based on the average life of spacecraft mission in operations (5-7 years). It recommended that 10 years be used in most application even for short duration missions, if it is anticipated that heritage information is necessary to support current and future missions (for example spare parts usage). If it is determined that 10 years is not the appropriate retention time based on mission design requirements, and/or operational results of the mission, then this should be communicated and the retention time adjusted accordingly. Data item deliverable for the contract should be reviewed to assure that verification data related to spare or unused parts is also addressed if it is anticipated that this data may be required at a later date. The inclusion of screening and qualification data with spare EEE parts is an example.
AQC26	Electrical Wire and Cable Test Report	Organization shall provide certification that each shipment of electrical wire or cable furnished under this contract conforms to the applicable specifications. For each lot or cable in each shipment, a certified test report or copy thereof shall be included with the packing sheet. The test report shall, at a minimum, include a record of the physical, chemical, or electrical (and in the case of RF cable, electronic) inspections and tests conducted to satisfy the acceptance	To provide traceability to wire and cable purchased for flight hardware or critical GSE. When the S.O.W. or design engineering imposes certification to a specification requirement. Combined with general C of C requirements.

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Clause #	Description	Basic Clause Language	Guidance
		requirements of applicable specifications, and shall include numerical results when applicable. For cable shipments, these requirements apply to both basic and finished cable. When the specification requires other inspection or test data to be reported, it shall be included in the test report. Reports shall provide the Organization or Supplier's name, the specification number and revision date or change letter, and other data required by the specification, and must be identified to or correlated with the lot shipped.	
AQC26 A	Wire (Silver-Plated)	The wire manufacturer shall certify that the following requirements are met: 1. Each lot of wire shall be traceable to the silver-plating bath. 2. Dry processing of insulation and dry dielectric testing is required. 3. Finished wire shall be shipped and stored with the ends capped to prevent diffusion of air and water vapor into the wire through open ends. 4. Water quenching was not used. Only an oil quench, dry processing and sealing are to be used. Such sealing is to include end capping and/or desiccation as soon as	NOTE: this clause is a requirement for silver-plated wire per MSFC-STD-2905.

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Clause #	Description	Basic Clause Language	Guidance
		possible.	
AQC27	EEE Parts Date of Manufacture	All Electrical, Electronic or Electromechanical (EEE) parts procured from the organization or its suppliers shall have been manufactured within three (3) years from the delivery date for Plastic Encapsulated Microcircuits (PEMs) and five (5) years for all others. This shall include all sub-assemblies of the article being procured. Any deviation from this requirement shall be in the form of a written authorization from the procuring agency, and the authorization shall be included with each shipment.	This clause applies primarily to flight and critical ground support equipment used for space mission where the part cannot be easily replaced and life is a consideration. This clause is applicable to EEE parts that are subject to degradation of performance or quality over extended periods of time and/or require traceability to the date of manufacture. Because of concerns about the solderability of connections this clause applies to most EEE parts. Special provision is made for PEMs in consideration of their non-hermetic construction and the risk of failure due to corrosion, and other construction-related weaknesses. There is no data item delivery associated with this clause, because the date of manufacture is usually marked on the part or packaging or accompanying documentation.
AQC28	EEE Single Lot / Date Code	The full quantity of date code controlled Electrical, Electronic, and Electromechanical (EEE) parts, each part number, provided under this Purchase Order / Contract must have a single lot-date code. The organization will obtain the written approval of the customer's authorized purchasing representative prior to shipping goods that do not meet this single lot / date code requirement.	This clause is applicable for procurements of lot number or date code controlled EEE parts that are subject to lot specific sample testing or require single lot traceability. Examples of EEE lot specific sample testing include, but is not limited to, Destructive Physical Analysis, radiation testing, and solderability testing.

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		In the event that the customer's purchasing representative provides said authorization to ship mixed lot / date codes, the organization shall provide a copy of the written authorization with the shipping document. When mixed lot / date codes are authorized, the shipping document shall list individual lot / date codes and quantity. Multiple lot / date codes shall not be co-mingled. In addition, the individual part containers shall be marked with the quantity and lot / date code.	For other parts that require general screening, such as visual inspection or Particle Impact Noise Detection (PIND) it may be advisable to implement this clause.
AQC29	Electrostatic Discharge (ESD) Protection Program and Packaging	The organization shall document and implement an ESD Control Program in accordance with ANSI/ESD S20.20, ESD Association Standard for the Development of an Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices). Parts must be properly packaged and identified as required in ANSI/ESD-S20.20. All goods will be placed in conductive or static-dissipative packages, tubes, carriers, conductive bags, etc., for shipment. The packaging must be clearly labeled to indicate that it contains electrostatic sensitive goods. Electrical parts that may be used or shipped in conjunction with ESD	If you are receiving parts that are ESD sensitive that are being used in a critical application, then the organization providing the parts should have an ESD protection program in compliance with ANSI/ESD 20.20. Parts sensitive to voltages less than 100 volts (e.g., unprotected gate oxide devices) require additional controls beyond those specified in ANSI/ESD S20.20 (i.e., double bagging). When the part is being procured to an existing technical specification, it should be reviewed prior to applying this clause to ascertain the ESD control requirements imposed by the standard to determine if this clause is necessary. Some military specifications (i.e., MIL-PRF-55182) contain incomplete ESD control requirements that must be further

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Clause #	Description	Basic Clause Language	Guidance
		sensitive parts shall be treated as ESD sensitive.	specified by the purchaser. For resistors procured to military specifications, refer to MIL-DTL-39032, Table I, to determine if the resistor being procured is ESD sensitive (ESDS). For other parts, refer to the part specification. When the ESD sensitivity of a part or assembly is not known or not identified (e.g., inputs/outputs at black box level), the item shall be treated as ESD sensitive. A copy of the ESD control plan is not recommended for inclusion as a data item deliverable under the contract. Note: This clause is applicable for procurement of ESD sensitive electrical piece parts excluding electrically initiated explosive devices.
AQC30	High-Strength Fasteners	Organization will include with each shipment a legible copy of the manufacturer's certification. The certification will include the following information: (a) Name and address of the manufacturer. (b) Part number and the ordering and procurement specification, including revision levels that controlled the manufacture of the goods. (c) Manufacturer's production order/lot number. (d) Raw material data: (1) Material specification. (2) Alloy class, type, or grade. (3) Raw material heat, lot, or melt number. (4) Name of raw material producer. (e) Chemical analysis report. (f)	Information on lot traceability can be provided by annotating the fastener's lot number on the shipper, certification, or packing list; any one of the three will be acceptable. When receiving high strength fasteners for use in a critical application, the customer should test them using an independent testing laboratory. Consideration should be given to requiring that all fasteners come from a single lot, and that they be provided with the manufacturer's lot traceability number and be accompanied by the manufacturer's certification. Additional quantity should be ordered to support the need for test specimens. For All 1/4-

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		Mechanical test report as defined by the applicable specification (e.g. Tensile and/or single/double shear strength). (g) Metallurgical examination report as defined by the applicable specification (e.g. microstructure and/or macrostructure). (h) NDT test results: dye penetrant, and magnetic particle results, when required by applicable specification. If Organization is not the manufacturer, Organization's name and Customer's purchase order/contract number will be referenced on the manufacturer's certification. Organization's Quality Control organization shall be responsible for ensuring that items of this Order are packaged in such a manner that the dimensional integrity is preserved, contamination and corrosion are prevented, and no physical damage occurs to the threads during shipment. The preferred method, when size permits, will be to individually sleeve the threaded portion of the fastener. Any method used shall insure that threads remain undamaged during shipment. Bulk packaging of unprotected threads is prohibited. Fasteners made of plain carbon or low alloy steel shall be protected from corrosion. When plating is specified, it shall be compatible with the space environment (as appropriate). On steels harder than RC 33, plating shall be applied by a process that is not embrittling to the steel	inch and larger externally threaded fasteners made of A286 material used on assemblies furnished under space flight or critical GSE contract must be manufactured by one of the NASA/MSFC - approved manufacturers (Marshall Space Flight Center (MSFC) Audited Vendor List (AVL). The MSFC AVL can be found at https://msfcsma3.msfc.nasa.gov/dbwebs/apps/avl/default.asp If critical fasteners are being procured from a source that has not been previously verified to have acceptable practices for fastener control, then the customer should consider whether to obtain a copy of the organizations Fastener Control Plan for review as part of the data item delivery for the contract. You should contact your appropriate customer organization for additional guidance.

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AQC30 A	Fastener (aerospace – critical)	CoC signed by the supplier Quality representative attesting that the fastener material complies with the specification requirements and the dimensional requirements are met. Certification validation testing on a representative sample per MSFC-STD-2594.	1. The manufacturer shall be audited and currently listed on the MSFC Approved Fastener Manufacturers List per MSFC-STD-2594. 2. The fastener must be purchased through an approved distributor or drop shipped from the approved manufacturer. 3. The fasteners must be purchased in single lots (no co-mingling). 4. Traceability to the manufacturer is required. ***5. Serialization and NDE of fracture critical fasteners is required. NDE reports and all other documentation as specified by MSFC-STD-2594, paragraph 4.4.1, must accompany each fastener shipment.***
AQC30 B	Fastener (aerospace – noncritical)	CoC signed by supplier Quality reprensentative attesting that the fastener complies with all specification requirements. Certification validation testing on a representative sample per MSFC-STD-2594.	1. The manufacturer shall be qualified per MSFC-STD-2594. ***2. The fastener must be purchased through an approved distributor or drop shipped from the approved manufacturer.***
AQC30 C	Fastener (commercial – noncritical)	CoC attesting that the fastener complies with the specification requirements.	NOTE: receiving inspection function to perform count/condition at receipt.
AQC31	Pressure Vessel	With each shipment, Organization shall provide two copies of American Society of Mechanical Engineering (ASME) Code Reports showing conformance of the units to the requirements of the Pressure Vessel Code. When required, the hardware markings must be in accordance with the applicable drawing/specification.	Use for the requirement of certification of pressure vessels for facility use only. Not for flight hardware or critical GSE pressure vessels.

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		The pressures tested/certified to and the method used shall be indicated.	
AQC32	Solvent Containers	All solvents must be supplied only in a new container that has not been used before to prevent contamination by residual material.	Applies to all solvent purchases
AQC33 A	Printed Wiring Boards (PWB's)	The supplier shall submit two microsectioned coupons for each panel of multi-layer PWB's fabricated. One coupon must be thermally stressed per MSFC-STD-2907, and the other coupon must be in the as-manufactured condition. The remainder of the coupons in the strip shall also be submitted.	1. A CoC for the opens and shorts test requirements of the drawing or MSFC-STD-2907 is required for each PWB. 2. Microsectioned coupons are not typically required for single and double sided PWB's.
AQC33 B	Electrical, Electro-mechanical, Electronic (EEE) Parts (cavity)	The supplier shall submit a CoC attesting that the required particle impact noise detection (PIND) and x-ray tests have been performed and the records are on file.	
AQC33 C	Connectors	The supplier shall furnish a manufacturer's CoC for each connector part unless the connector was kitted by a manufacturer that fabricated all constituent parts. Each CoC must certify that the individual connector part meets the individual part specification (not necessarily the connector body specification) including all quality conformance inspection requirements.	
AQC33 D	Resistors, Military, Electro-static Discharge	Line item X shall be packaged by the manufacturer in accordance with MIL-R-39032 to preclude damage from ESD. If the supplier of this line item is not the	NOTE: prior to assigning quality requirements for resistors procured to military specifications, refer to MIL-R-39032, Table I, to determine if the resistor being procured is ESD

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	Sensitive	manufacturer, then the supplier shall provide certification that the item was received in ESD protective packaging and has been handled and stored using ESD precautions in accordance with MIL-R-39032.	sensitive (ESDS). Due to "MIL-R" revisions, ESD packaging may no longer be required by the basic military specification (e.g. MIL-PRF-55182